

200

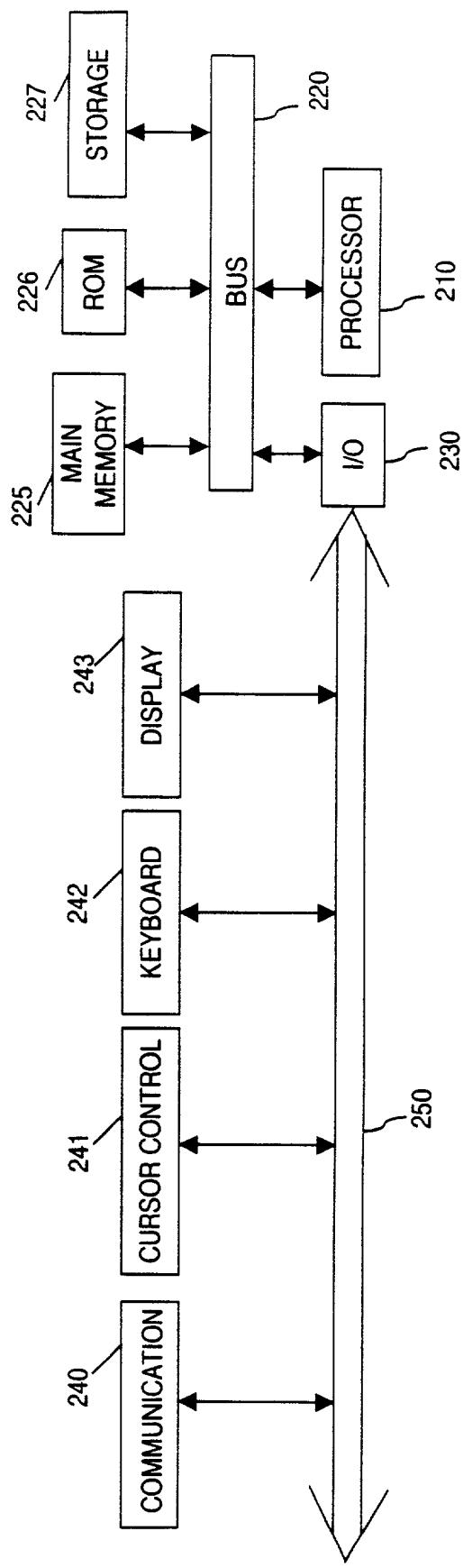


FIG. 1

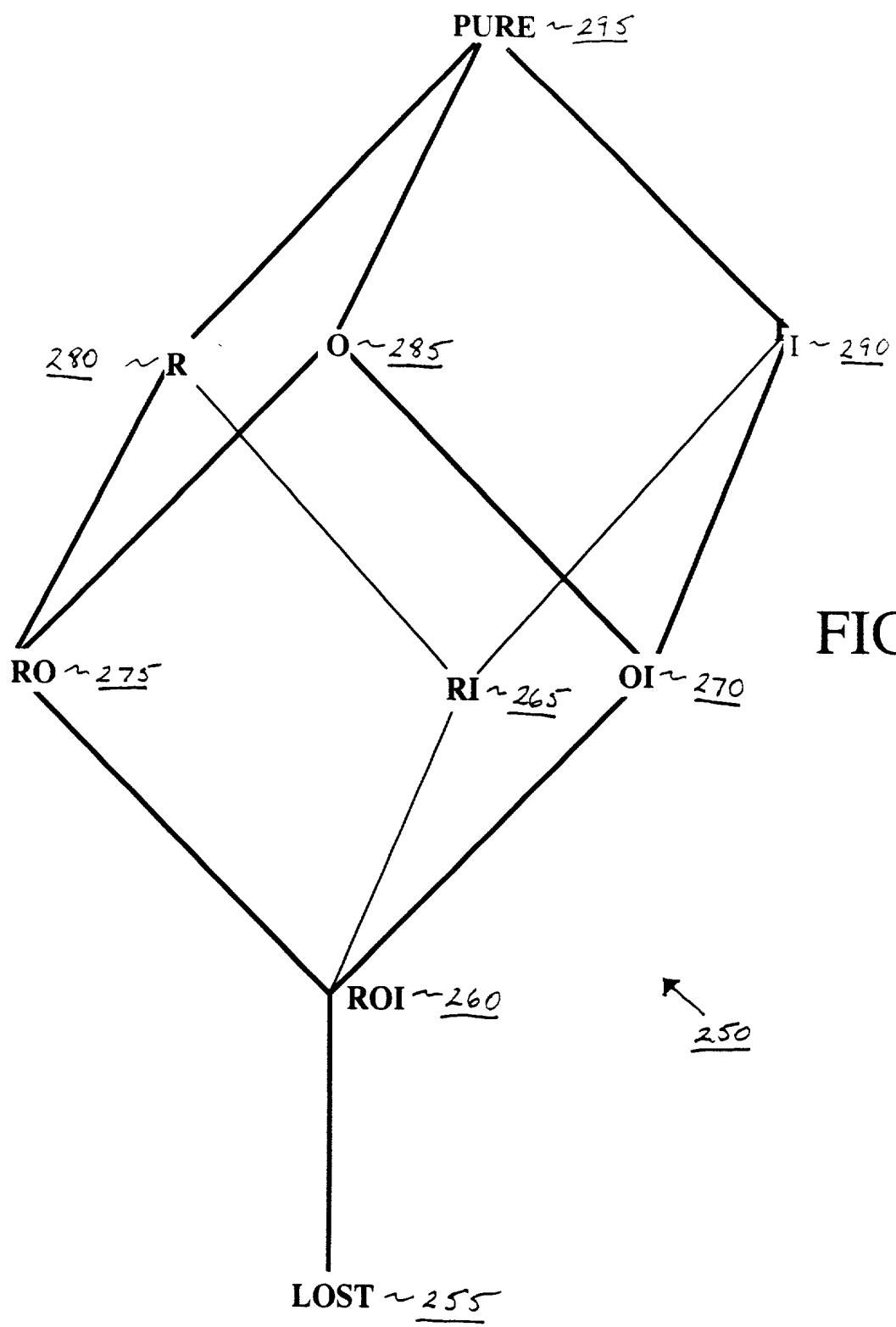


FIG. 2

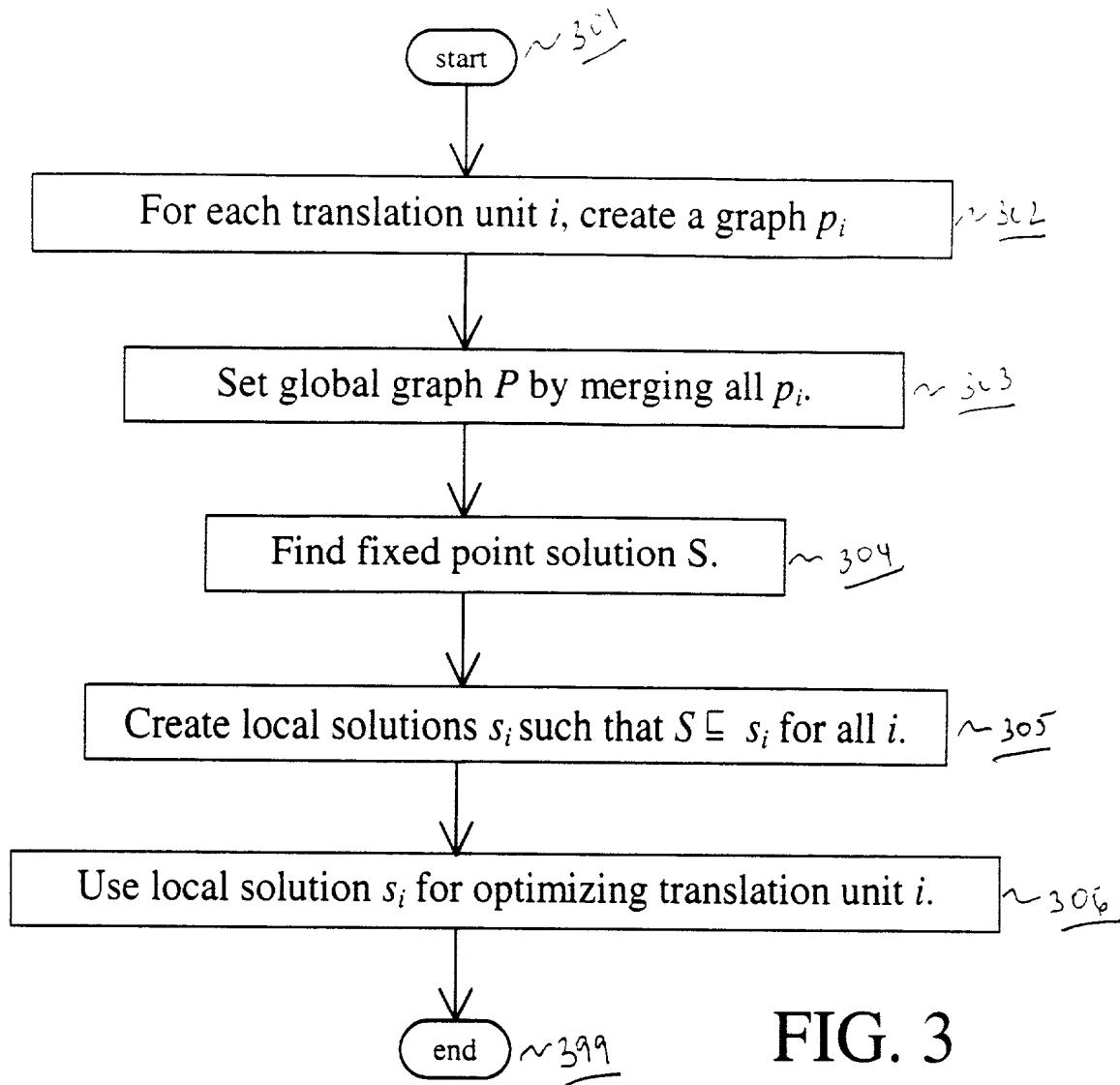


FIG. 3

FIG. 4A

Function	Function (x,y)
<u>410</u> ~ TOP	(PURE,PURE)
<u>420</u> ~ COPY	(y,y)
<u>430</u> ~ IN_TO_LOST	if $y \leq I \Rightarrow (LOST,LOST)$ otherwise $\Rightarrow (PURE,PURE)$
<u>440</u> ~ UNRETURN	if $y = LOST \Rightarrow (LOST,LOST)$ otherwise $\Rightarrow (z,z)$ where $z = y \sqcup OI$
<u>450</u> ~ COPY_AND_IN_TO_LOST	if $y \leq I \Rightarrow (LOST,LOST)$ otherwise $\Rightarrow (y,y)$
<u>460</u> ~CAT_FORMAL	(y,PURE)
<u>470</u> ~CAT_ACTUAL	(PURE,y)
<u>480</u> ~ GATE	if $x = LOST \Rightarrow (LOST,LOST)$ else if $x \leq R \Rightarrow (z,z)$ where $z = (x \sqcup OI) \sqcap y$ else (z,z) where $z = (x \sqcup OI)$

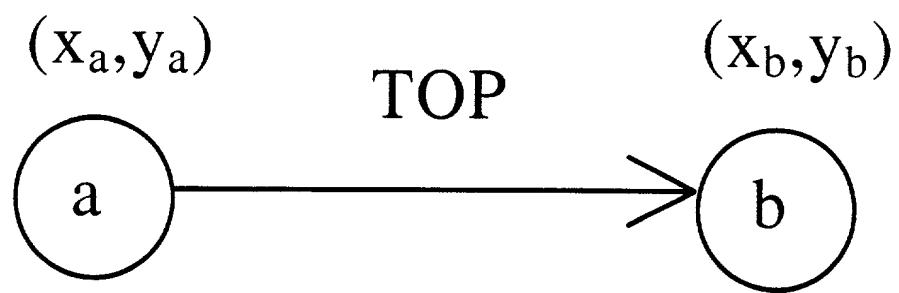


FIG. 4B

FIG. 5

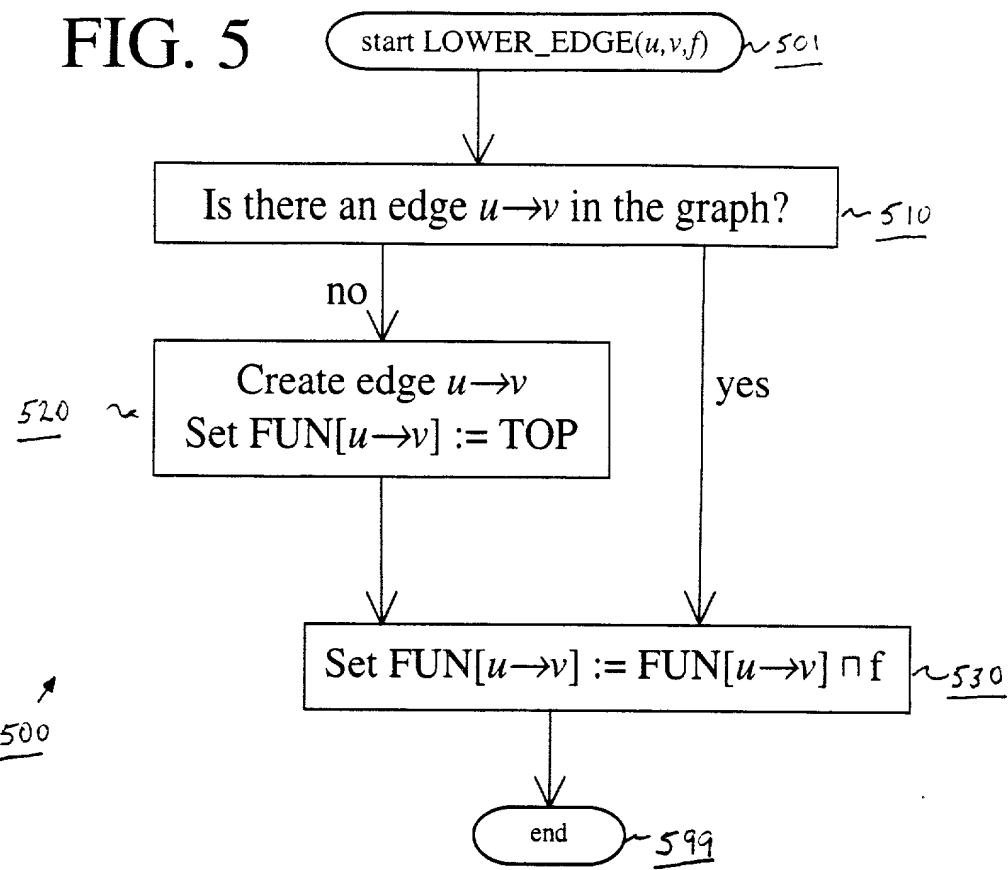
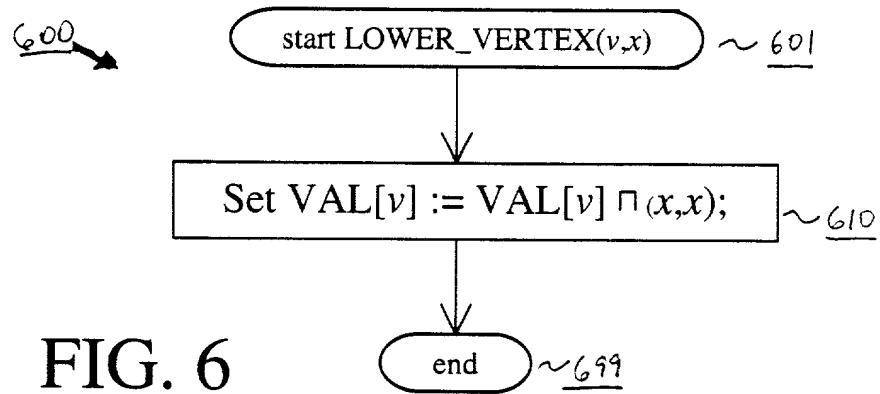


FIG. 6



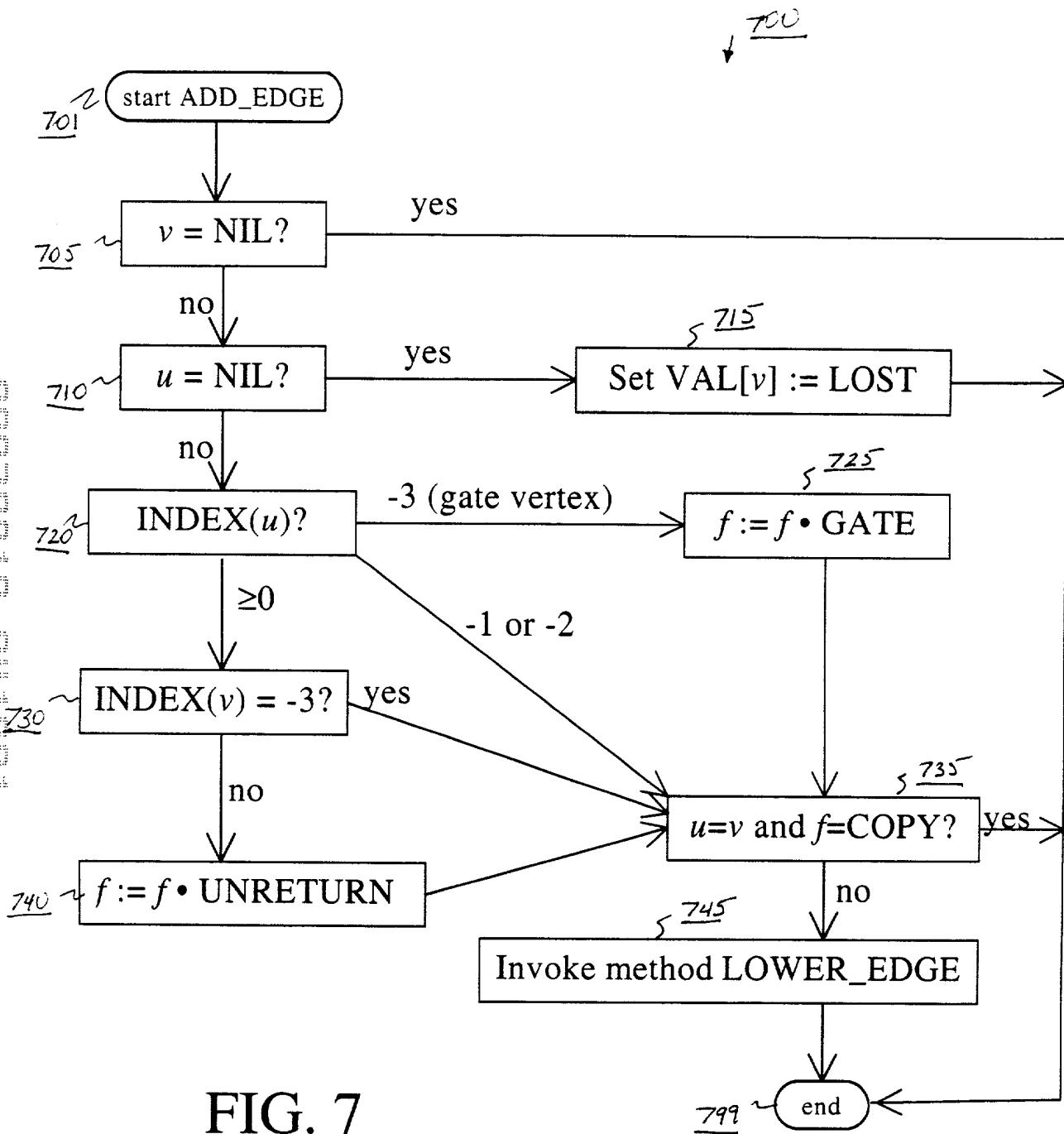
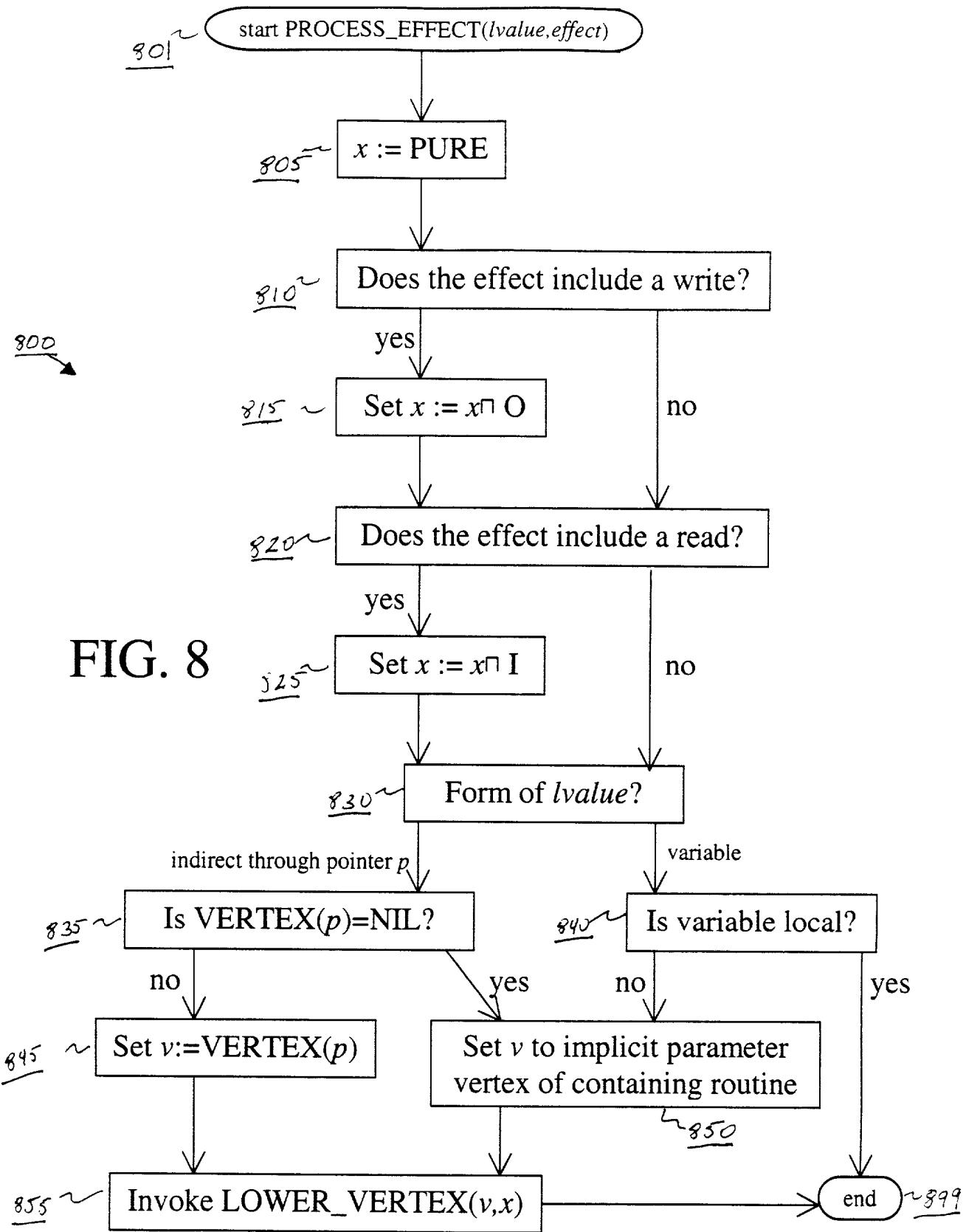


FIG. 7



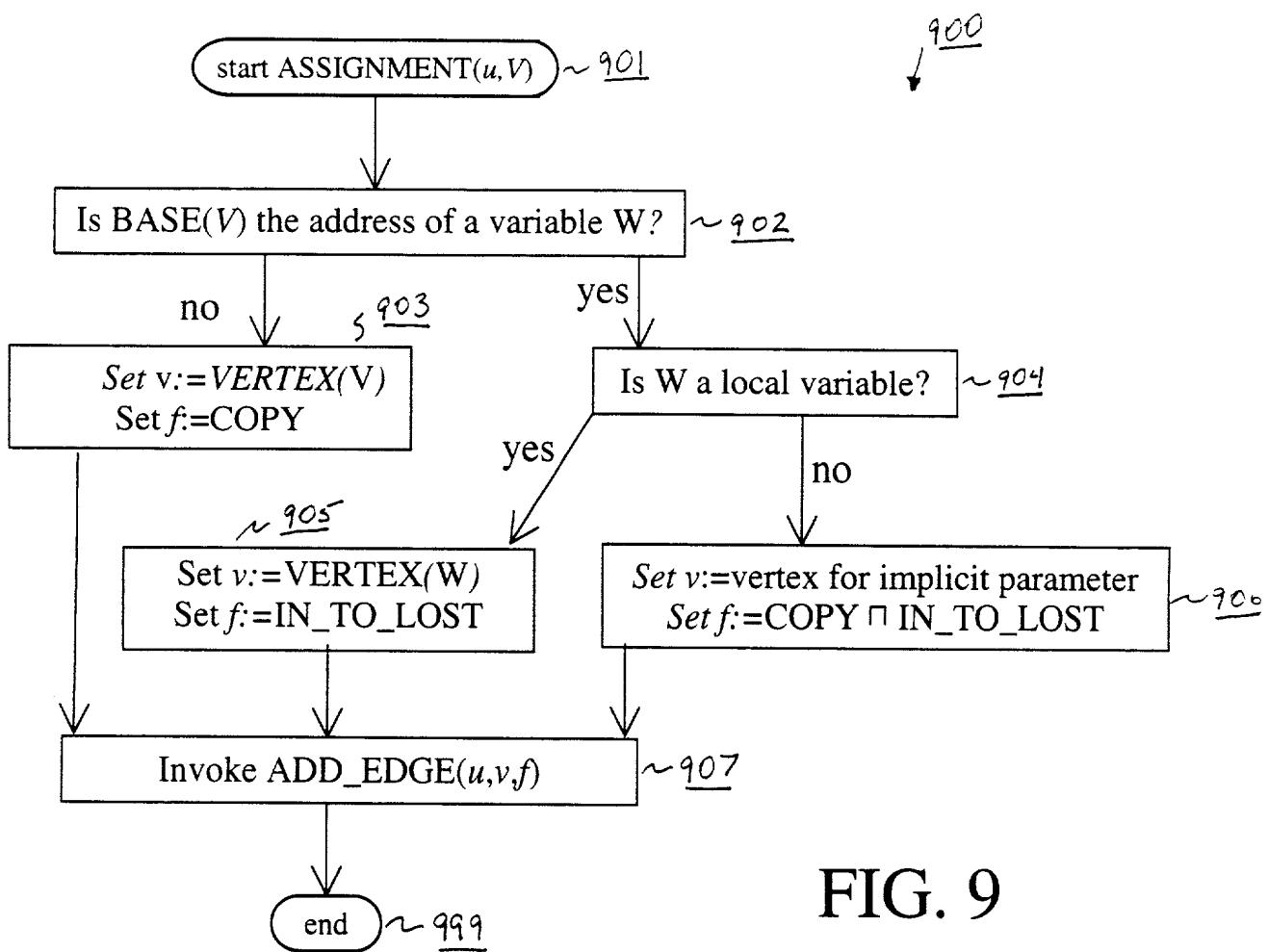


FIG. 9

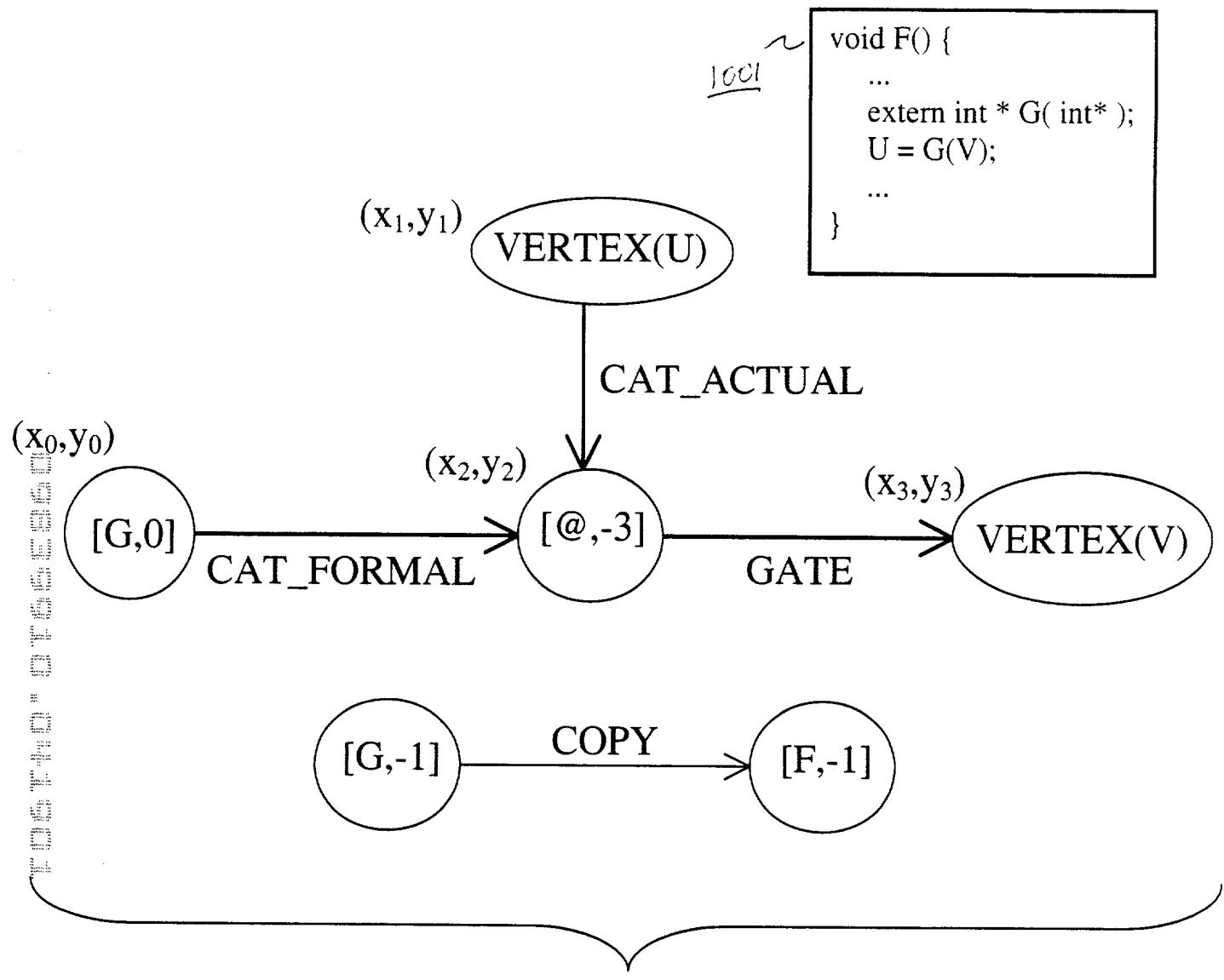


FIG. 10

```
// Translation unit #1

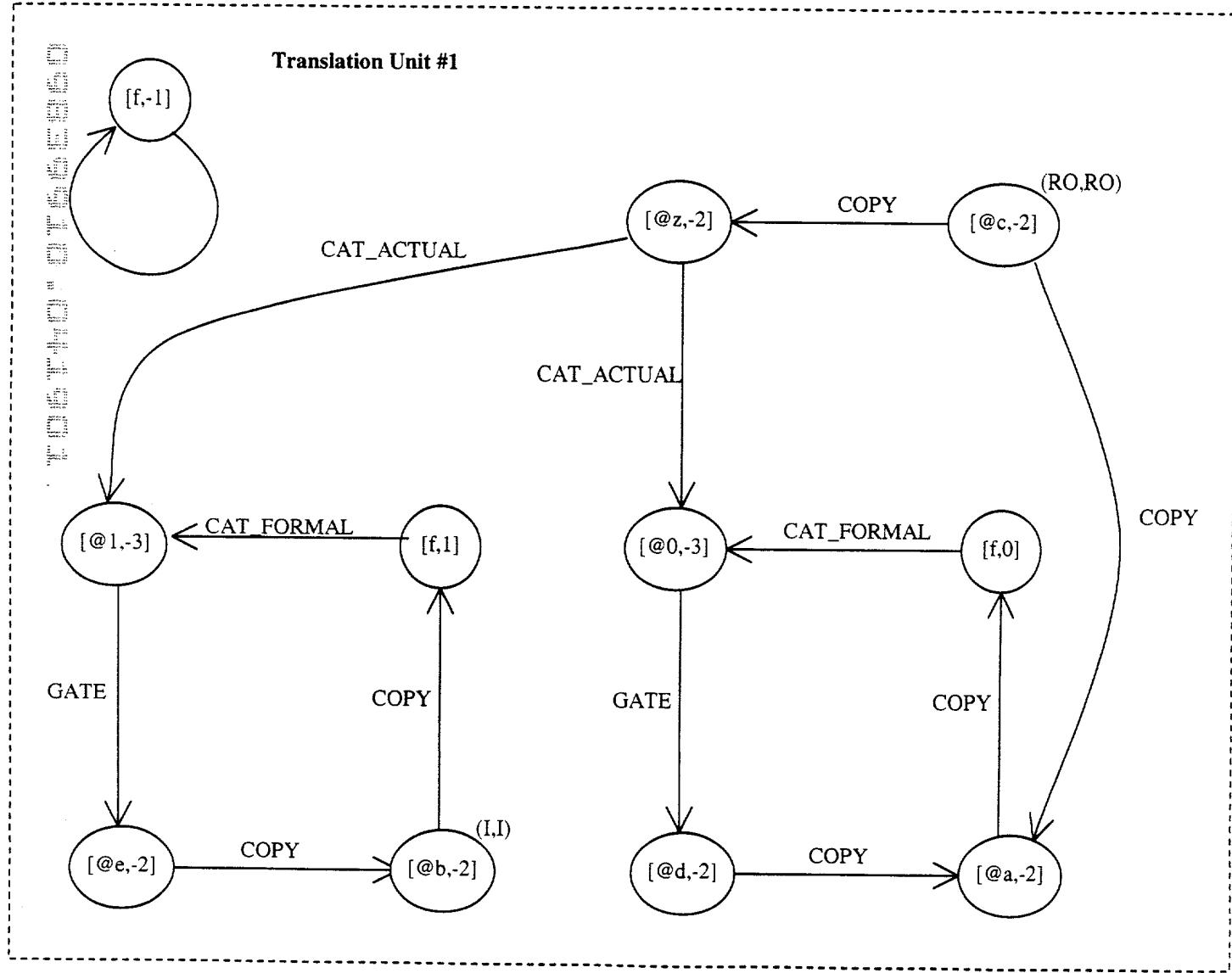
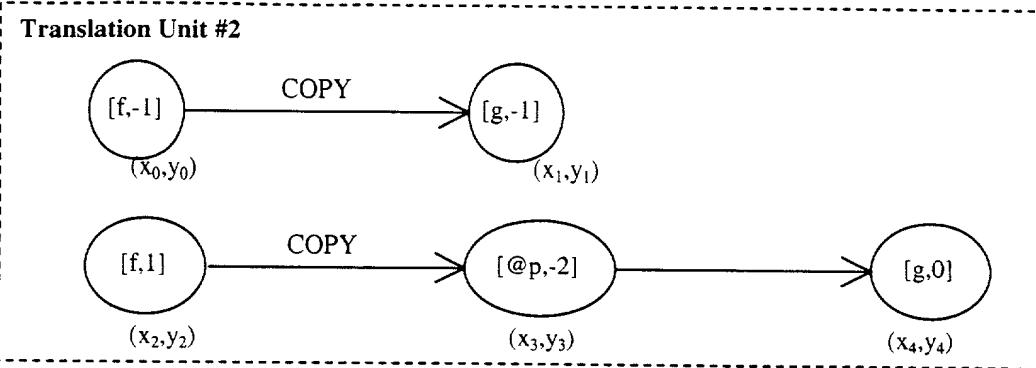
int* f( int* a, int* b, int n ) {
    int *c = a;
    if( n>0 ) {
        int* d = a+1;
        int* e = b+1;
        int* z = f( d, e, n-1 );
        c = z-1;
        *c = *b;
    }
    return c;
}
```

```
// Translation unit #2
extern int* f(int* a, int* b, int n );

void g( int* p ) {
    int y[10];
    f( &y[0], p, 10 );
}
```

FIG. 11

FIG. 12



Translation Unit #1	
<u>Source line</u>	<u>Action</u>
(entry into f)	Add [@a,-2] → [f,0] Add [@b,-2] → [f,1]
int *c = a;	Add [@c,-2] → [@a,-2]
n>0	None
int *d = a+1;	Add [@d,-2] → [@a,-2]
int *e = b+1;	Add [@e,-2] → [@b,-2]
int* z = f(d,e,n-1)	Add [@z,-2] → [@0,-3] → [@d,-2] Add [f,0] → [@0,3] Add [@z,-2] → [@1,-3] → [@b,-2] Add [f,1] → [@1,3] Add [f,-1] → [f,-1]
c = z-1;	Add [@c,-2] → [@z,-2]
*c = *b;	Lower VAL[[@c,-2]] to O Lower VAL[[@b,-2]] to I
return c;	Lower VAL[[@c,-2]] to R

Translation Unit #2	
<u>Action</u>	<u>Action</u>
int *p = &x[0];	None
for(int i=0; i<10; i++)	None (no pointer assignments)
*p = i;	Lower VAL[[@p,-2]] to O
p=p+1	None (edge omitted by self-loop rule)
c = z-1;	Add [@c,-2] → [@z,-2]

FIG. 13